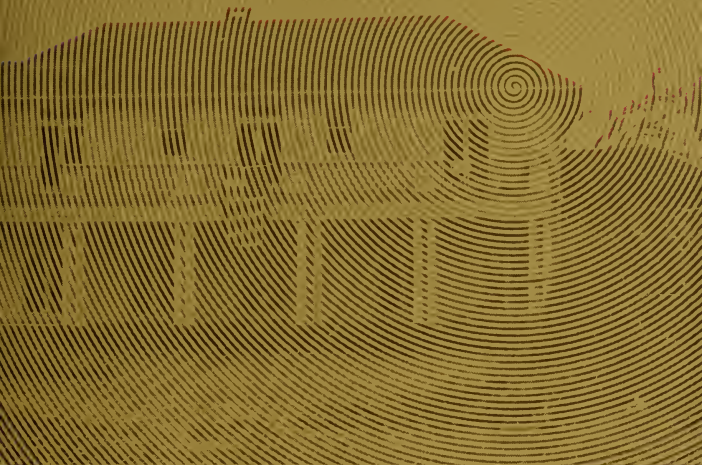
DIVIDENDS FROM WOOD RESEARCH

Recent publications of the
Forest Products Laboratory
July 1 to December 31, 1969
Forest Service
U.S. Department of Agriculture



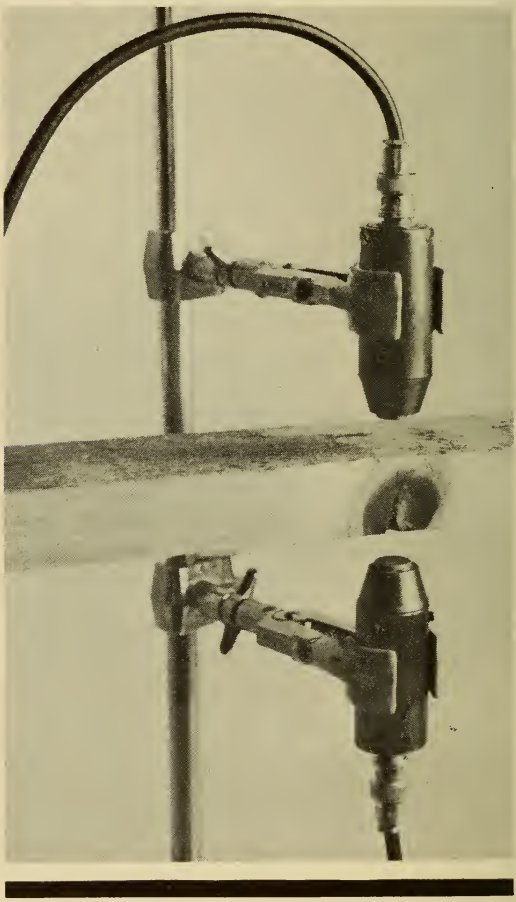
1.
Wood structures survive hurricane Camille's winds.

by H. F. Zornig and G. E. Sherwood
U.S. Forest Serv. Res. Paper FPL 123, 16 pp., Oct. 1969

Wood-frame buildings exhibited remarkable resistance to the 190-mile-an-hour winds with which Hurricane Camille lashed the Mississippi Gulf coast the night of August 17, 1969, the authors report.

The few cases of severe wind damage were due to poor nailing practices that resulted in poor interaction and support between structural components. Heaviest damage was caused by pounding of 20-foot waves and flooding near the beaches.

Good construction practices are essential for survival of houses and other buildings in such heavy winds, the authors conclude. Wave and flood damage could be lessened by building well-anchored structures on poles. Mobile homes are easily blown over unless tied down, they found.



2.
Locating lumber defects by ultrasonics.

by K. A. McDonald, R. G. Cox, and E. H. Bulgrin
U.S. Forest Serv. Res. Paper FPL 120, 12 pp.,
Oct. 1969

An ultrasonic scanning system proved a highly promising way of locating and recording lumber defects in experiments aimed at automated control of lumber processing.

Knots, and the distorted grain around knots, were located in rough green hardwood lumber by evaluating relative differences in transit time. Sound pulses pass through knots and along distorted grain faster than across the grain in clear wood.

Ultimately the scanning system would provide a mathematical description of a board and its defects as imput to a computer-controlled processing system.

Further research is needed to ascertain how well this ultrasonic technique works with other defects, such as holes, checks, decay, and wane.

ITEMS FOR FREE DISTRIBUTION are numbered, and available from the Forest Products Laboratory while the supply lasts. To request publications simply circle the appropriate number on the back cover of this list, detach, and mail to the Laboratory. Blanket requests for publications cannot be filled.

Reports of slight interest to the layman are designated "Highly technical."

Other recent FPL publications

BOARD AND PANEL MATERIAL

3. Treatments to reduce thickness swelling of phenolic-bonded particleboard, by B. G. Heebink and F. V. Hefty. Forest Prod. J. 19(11):17-26, Nov. 1969.

Ten-minute treatments of phenolic-bonded particleboard in saturated steam at 360° F. were exceedingly effective in reducing thickness swelling and springback. Treatments in hot air (2 hrs. at 425° F.) were effective in reducing springback, but severely dried the boards. Superheated steam and pretreatment of the flakes with saturated steam at 360° F. were relatively ineffective.

CONSTRUCTION

4. Designs for low-cost wood homes, by L. O. Anderson and Harold F. Zornig. USDA Forest Service, 28 pp., 1969.

Eleven house designs of varying style and size are described. These houses, which can be built at approximately one-half of normal construction costs, have all the essentials necessary to provide comfortable living for families with up to 12 children.

5. Experimental pole-type structure: Initial evaluation, by D. V. Doyle. USDA Forest Serv. Res. Paper FPL 115, 20 pp., Sept. 1969.

This first report details the increase in rigidity that resulted from addition of each component to a pole-type building erected at the Forest Products Laboratory. Also gives an initial evaluation of the trussed rafters used in the structure, including adequacy of materials and methods of attachment for gusset plates.

DRYING

6. Accelerated kiln drying of presurfaced 1-inch northern red oak, by J. M. McMillen. USDA Forest Serv. Res. Paper FPL 122, 31 pp., Dec. 1969.

The first report from a research program whose goal is a 30 percent reduction in drying time for oak. Reviews background, and indicates that northern red oak fully surfaced on both faces to 1.00 inch can be kiln dried from 87 to 5 percent average moisture content in 14-1/4 days, using a moderately accelerated kiln schedule.

7. Influence of initial drying temperatures on the development of warp in one-inch hard maple, by Raymond C. Rietz. Forest Prod. J. 19(7):37-40, July 1969.

In drying hardwoods, the dry-bulb temperature used during the period of free-water evaporation influences shrinkage. Higher temperatures cause greater shrinkage. Increased warp was therefore expected. This study detected no significant differences in warp when 1-inch green hard maple lumber was dried at initial temperatures up to 160° F.

GLUES AND GLUED PRODUCTS

8. Odor problems from some plywoods, by D. F. Zinkel, J. C. Ward, and B. F. Kukachka. Forest Prod. J. 19(12):60, Dec. 1969.

Some plywood made from South American lupuna and banak woods emitted unpleasant odors when the finished panels were subjected to hot, humid atmospheres. The odors were identified as volatile fatty acids, the products of bacterial fermentation which occurred during water storage and transportation of the logs.

9. Performance of southern pine plywood during 5 years of exposure to weather, by M. L. Selbo. Forest Prod. J. 19(8):56-60, Aug. 1969.

Evaluates phenolic-resin-bonded Douglas-fir and southern pine plywood, overlaid and not overlaid, and painted with acrylic-emulsion paint, before exposure to the weather. Except for mold growth (heaviest on the pine), overlaid panels of both species were in excellent condition after 5 years' exposure.

GRADING

10. Charts for calculating dimension yields from hard maple lumber, by George H. Englerth and David R. Schumann. USDA Forest Serv. Res. Paper FPL 118, 12 pp., Oct. 1969.

Charts are given for determining yields of dimension from various grades of hardwood lumber. The basic chart for each grade is for 2-inch-wide material, with an adjustment for determining yields in other widths.

MECHANICAL PROPERTIES

11. Evaluating Appalachian woods for highway posts, by D. V. Doyle and T. L. Wilkinson. USDA Forest Serv. Res. Paper FPL 111, 20 pp., July 1969.

Appraises strength characteristics of round and sawed posts of hickory, oak, and pine for guard posts, sign posts, and other accessory items for highway use. Also provides applicable data on treating characteristics of these species for these purposes.

12. Fatigue strength of finger joints, by Billy Bohannan and Karl J. Kanvik. USDA Forest Serv. Res. Paper FPL 114, 8 pp., Sept. 1969.

Specimens of two types of finger joints used for end-jointing dimension lumber were evaluated under cyclic loading at various stress levels. The relative fatigue strength of the joints in tension parallel to grain after 30 million cycles of load equalled about 40 percent of static strength.

13. Large glued-laminated timber beams with two grades of tension laminations, by Billy Bohannan and R. C. Moody. USDA Forest Serv. Res. Paper FPL 113, 45 pp., Sept. 1969.

Bending strength of 26 glued-laminated timbers was appraised as a basis for more precise design. Part of the beams were manufactured according to present AITC and lumber industry specifications, while the other beams had improved tension laminations.

14. Modulus of elasticity and bending strength ratio as indicators of tensile strength of lumber, by I. Orosz. J. of Materials 4(4):842-864, Dec. 1969.

Modulus of elasticity (E) measured over 4-foot span was found to be a better predictor of tensile strength than E measured over full span. The combination of the short-span E and bending strength ratio is a better estimator than either variable by itself. Together, they explain 75 percent of the variation of tensile strength.

15. Rail shear test for evaluating edgewise shear properties of wood-base panel products, by J. Dobbin McNatt, USDA Forest Serv. Res. Paper FPL 117, 16 pp., Oct. 1969.

The rail shear test used extensively at the Forest Products Laboratory to determine the edgewise shear strength of wood-base panel products is described and evaluated.

16. Structural timber research at the Forest Products Laboratory, by Fred Werren. J. of the Structural Div., Proc. of the Amer. Soc. of Civil Engineers, 95(ST12):2891-2906, Dec. 1969.

Reviews recent Laboratory progress in areas of structural lumber grading, wood-base and related materials, glued-laminated construction, round timber evaluations, housing, timber bridges, wood building foundations, trussed rafters,

shear stiffness of wood decks, adhesives for structural laminating, and fire research.

17. Residual stresses in curved laminated wood beams, by John J. Zahn. J. of the Structural Div., Proc. of the Amer. Soc. of Civil Engineers 95(ST12):2873-2890, Dec. 1969.

Residual stresses due to bending of the laminations to curvature and due to variations in subsequent shrinkage of individual laminations are analyzed. Time-related effects are ignored. Possible relation to radial tension separations is discussed. Equations of elasticity are derived for a curvilinear-orthotropic material in polar coordinates. (Highly technical)

PACKAGING

18. Appalachian hardwoods for pallets: Effect of fabrication variables and lumber characteristics on performance, by R. S. Kurtenacker. USDA Forest Serv. Res. Paper FPL 112, 20 pp., Aug. 1969.

This study, limited to yellow-poplar and hickory, considers the effect of different assembly methods and lumber characteristics on pallet performance. Rough handling tests indicated that serviceable bin pallets of at least two designs can be fabricated from Appalachian hickory and yellow-poplar.

19. Container effects in cushioned packages: urethane foam corner pads, by C. A. Jordan. USDA Forest Serv. Res. Paper FPL 109, 20 pp., Aug. 1969.

Cushioning applied as corner pads produced results similar to side-pad cushioning studied earlier. A direct relationship was indicated between rigidity of outer container and the severity of shock to the contents.

20. Cushioning properties of five-layer corrugated fiberboard pads: Load applied to central area only, by C. A. Jordan. USDA Forest Serv. Res. Paper FPL 116, 12 pp., Sept. 1969.

The response to dynamic compression of multilayer corrugated fiberboard cushioning partially loaded in the central area is substantially different than the response of the same material fully loaded. A simple relationship between load area

diameter and optimum performance criteria is given for the material and load method studied.

21. Effect of glue skips on corrugated fiberboard container compressive strength, by J. W. Koning, Jr. and R. C. Moody. Tappi 52(10):1910-1915, Oct. 1969.

Theoretical analysis and experimental results both indicated that glue skips adversely affect the compressive strength of corrugated fiberboard containers and that the magnitude of the effect is related to the width of the glue skip and characteristics of the component paperboards. Varying width glue skips significantly increased the variability of compressive strength within a specific lot of containers.

22. Now you can easily check your corrugated box adhesive's water resistance, by J. W. Koning, Jr. Package Eng. Aug. 1969.

A cantilever beam test of corrugated fiberboard was found to be a better indicator of the corrugated adhesive's performance than the test most commonly used. Experiments indicated that the beam test is simple to conduct, requires inexpensive equipment, and the results correlate well with container performance.

23. Testing corrugated corner pads, by C. A. Jordan. Modern Pack. Sept. 1969.

Cushioning with multilayer corrugated fiberboard corner pads depends greatly on the nature and rigidity of the outer container. The work also showed that shock cushioning design curves for pads loaded under these conditions could be derived from a relatively small quantity of pertinent experimental data.

PERFORMANCE OF WOOD IN FIRE

24. Thermogravimetric analysis of wood lignin and hemicelluloses, by F. C. Beall. Wood and Fiber, pp. 215-226, Oct. 1969.

Dynamic thermogravimetric analyses were performed on five types of lignin and nine preparations of hardwood and softwood hemicelluloses. Kinetic parameters were determined for pyrolysis reactions in nitrogen and combustion reactions

in oxygen at a heating rate of 60° C. per minute between 25° and 1000° C.

25. Exploratory investigation of fire-retardant treatments for particleboard, by Arthur D. Syska. USDA Forest Serv. Res. Note FPL-0201, 20 pp., Aug. 1969.

Douglas-fir and aspen flake-type particleboards made with combinations of common fire-retardant chemicals applied in several ways are evaluated for flammability and mechanical strength and dimensional stability.

PHYSICAL PROPERTIES

26. Sapwood thickness of Douglas-fir and five other western softwoods, by L. E. Lassen and E. A. Okkonen. USDA Forest Serv. Res. Paper FPL 124, 16 pp., Oct. 1969.

Sapwood thickness measurements, of primary interest to preservative treating of forest products, showed an increase with increasing tree diameter. In addition, Douglas-fir sapwood thickness was greater in the Coast type than in the Interior type for trees of the same diameter. Also for Coast Douglas-fir, sapwood thickness decreased with increasing elevation, and trees having the most rapid diameter growth had the thickest sapwood.

27. Reflected-light and scanning electron microscopy of ultraviolet irradiated redwood surfaces, by V. P. Miniutti. 1969 Proc. of Engis International Stereoscan Colloquium, pp. 135-147.

The usefulness of two types of microscopes in research on degraded, fragile wood surfaces is discussed. Photographic comparisons of bordered pits and crassulae in redwood tracheids before and after ultraviolet irradiation are presented. Each microscope has particular advantages for specific purposes, and both are very useful in research on wood surfaces. (Highly technical)

PROTECTION FROM TERMITES

28. Termites in Wisconsin, by Glenn R. Esenther. Annals of the Entomological Society of America 62(2): 1274-84, Nov. 1969.

Termites appear to be introduced to northern municipalities by human transport. Discusses factors affecting the ability of termites to become established. The seasonal activity and development in areas of cold winter climates is described. A graphic life cycle of the termite and a nutritional mechanism of caste determination also are presented.

SAWING AND MACHINING

29. Control of veneer thickness during rotary cutting, by J. F. Lutz, A. F. Mergen, and H. R. Panzer. Forest Prod. J. 19(12):21-28, Dec. 1969.

Shows that the uniformity of thickness of rotary-cut veneer can be improved by keeping all moving parts of the lathe close fitting, keeping the pressure bar shut during roundup and throughout the cutting, using low nosebar pressure, and preloading the knife carriage against the wood bolt.

30. Effect of cutting speed during thick slicing of wood, by C. C. Peters, A. F. Mergen, and H. R. Panzer. Forest Prod. J. 19(11):37-42, Nov. 1969.

Red oak, southern pine, and yellow-poplar at 190° F. were sliced 1/2 and 1 inch thick at 5, 50, 200, and 500 fpm with a 20° knife and 15° conventional-with-restraint bar. Depth of fractures rapidly increased with increasing speed, while thickness uniformity was unaffected. Knife and bar forces were measured. (Highly technical)

31. Slicing wood one-inch thick; four types of pressure bars, by C. C. Peters, A. F. Mergen, and H. R. Panzer. Forest Prod. J. 19(7):47-52, July 1969.

One-inch-thick slices of red oak, Douglas-fir, and aspen were cut at low speed and 200° F. with a 21° knife and four pressure bars. The bars included 1-1/4-inch-diameter, free-rolling and driven, conventional 15° and conventional-with-

restraint. The latter bar performed best. Forces were measured. (Highly technical)

STRUCTURE AND GROWTH CONDITIONS

32. A simplified method of determining the age of trees from ring counts, by Robert R. Maeglin. Forest Farmer 29(1):8, Oct. 1969.

To aid ring counting on increment cores a simple method using soft chalk is described. By rubbing the increment core with chalk and then wiping it clean the annual rings become visible to the eye.

33. Effect of rainfall and elevation on specific gravity of coast Douglas-fir, by L. E. Lassen and E. A. Okkonen. Wood and Fiber 1(3):227-235, Oct. 1969.

Analysis is made of the effects of five ranges of summer precipitation and three ranges of elevation on variation in specific gravity of coast Douglas-fir. Specific gravity, percentage of latewood, and thickness of latewood tracheid wall decreased with wet summers and to some degree with increasing elevation. (Highly technical)

34. Relationship of black walnut wood color to soil properties and site, by Neil D. Nelson, Robert Maeglin, and Harold E. Wahlgren. Wood and Fiber 1(1):29-37, Spring 1969.

Evaluation of black walnut wood color showed greater differences between trees in luminance than in dominant wavelength and purity. Luminance values were also higher for Indiana-grown trees than for Missouri-grown and were related to specific soil properties. (Highly technical)

35. Seasonal development of secondary xylem in Pinus strobus L., by L. Murmanis and I. Sachs. Wood Sci. and Tech. 3:177-193, 1969.

Investigation of the development of secondary xylem shows that it was gradual. Xylem mother cells at first are small

cells with thin cell walls and then enlarge radially. When these cells reached the radial diameter of mature tracheids, the secondary wall deposition began. This investigation shows that physical properties of tracheids can differ with stages of development. (Highly technical)

36. Structure of pit border in Pinus strobus L., by L. Murmanis and I. Sachs. Wood and Fiber 1(1): 7-17, Spring 1969.

Sections from white pine trees were studied by electron microscopy in a search for the organization of cell wall layers in the pit border. Depending on the developmental stage of the tracheids, differences appeared in the pit border within the same tree species. A diagram was reconstructed that appears to be the most representative structure for the pit border in white pine. (Highly technical)

WOOD CHEMISTRY

37. Lignin and its uses by John M. Harkin. USDA Forest Serv. Res. Note FPL-0206, 9 pp., July 1969.

A primer for the layman telling in nontechnical language what lignin is, what its function is in nature in woody plants, why it is important as a byproduct of pulp and paper production and as an environment pollutant, and how it can be put to many useful purposes.

38. Absolute configuration of calamenene, 7-hydroxycalamenenal, and the new naturally occurring sesquiterpene, 7-hydroxycalamenene by J. W. Rowe and J. K. Toda. Chem. and Ind. 27:922-3, July 5, 1969.

A new sesquiterpene, 7-hydroxycalamenene, has been isolated from Ulmus thomasii heartwood and correlated with 7-hydroxycalamenenal and calamenene. Preparation of 7-hydroxycalamenene from (-)-copaene proves that all three sesquiterpenes have the S configuration of the isopropyl group. The secondary methyl group is shown to be probably trans to the isopropyl group. (Highly technical)

39. Lignans of Ulmus thomasii II, Lignans related to thomasic acid by F. D. Hostettler and M. K. Seikel. Tetrahedron 25(11):2325-37 (1969).

Three disyringyl lignans closely related to thomasic acid have been isolated from aqueous extracts of Ulmus thomasii heartwood. These are thomasidioic acid, racemic lyoniresinol and (+)-lyoniresinol-2α-0-rhamnoside. The series has trans stereochemistry in the 1,2-positions. Also isolated were 6-hydroxy-5,7-dimethoxy-2-naphthoic acid and 2,6-dimethoxybenzoquinone. (Highly technical)

40. Methods of attacking the problems of lignin structure by J. M. Harkin. Chapter in "Recent Advances in Phytochemistry," Vol. II, edited by M. K. Seikel and V. C. Runeckles. Appleton-Century-Crofts, New York, 1969.

Reviews with many references physical, chemical, and biochemical methods used to isolate, purify, and characterize lignin from wood; explains how lignin is formed in plants and presents a structural formula for softwood lignin. Good introduction to the lignin field for chemists, biochemists, botanists, and other nonspecialists. (Highly technical)

41. New carbonyl compounds from dehydrogenation of p-cresol by C.-L. Chen, W. J. Connors, and W. M. Shinker. J. Org. Chem. 34:2966 (1969).

As a simple model for lignin production and decomposition in nature by phenol oxidation, p-cresol was dehydrogenated with peroxidase/H_2O_2 or $FeCl_3$, and the resultant products were compared; the structures of new trimers were elucidated using NMR and mass spectroscopy; mechanisms for their mode of formation are given. (Highly technical)

42. Phenolic constitutents of elm wood: 2-naphtholic acid derivatives from Ulmus thomasii by C.-L. Chen and F. D. Hostettler. Tetrahedron 25:3223-29 (1969).

Two new 2-naphthoic acid derivatives, 6-hydroxy-5,7-dimethoxy-2-naphthoic acid and 6-hydroxy-3-hydroxymethyl-5,7-dimethoxy-2-naphthoic acid lactone, have been isolated from the aqueous extract of the heartwood of Ulmus thomasii. (Highly technical)

43. Phenolic glucosides from needles of Larix laricina, by Gerard J. Niemann. Phytochemistry, Vol. 8, pp. 2101-2103. 1969.

Three phenolic glucosides were isolated from needles of

Larix laricina and identified as the β-glucosides of vanillic acid and p-coumaric acid and as the α-glucoside of p-hydroxybenzoic acid. (Highly technical)

44. Unusual resin acids in tall oil, by D. F. Zinkel, J. W. Rowe, L. C. Zank, D. W. Gaddie, and E. R. Ruckel. J. of the Amer. Oil Chem. Soc. 46(11): 633-634, 1969.

An intermediate distillation function of tall oil has been shown to contain isomers of isopimaric acids in addition to a resin acid produced as an artifact in the pulping process. (Highly technical)

45. Water-induced recrystallization of cellulose by D. F. Caulfield and R. A. Steffes. Tappi 52(7):1361-6 (1969).

The recrystallization of amorphous cellulose upon exposure to moisture was investigated by physical methods including X-ray diffraction measurements. It was shown that substantial increases in crystallinity occur on wetting rather than on subsequent drying. The possible implications of this recrystallization process in pulp refining are discussed. (Highly technical)

WOOD FIBER

46. Butt swells of water tupelo for pulp and paper, by J. F. Laundrie and J. S. McKnight. USDA Forest Serv. Res. Paper FPL 119, 12 pp., December 1969.

Bleached kraft and neutral sulfite semichemical pulps from butt swells of water tupelo were found to be suitable for good-quality greaseproof papers and corrugating medium, respectively.

47. Corrugating furnishes and mediums--their microscopy, sheet properties, and runnability, by Forrest A. Simmonds. Southern Pulp and Paper Manufacturer, 32(12):66, 68, 70-72, 74, 75. Dec. 10, 1969.

It has been shown that sheet properties of stretch, folding endurance, and ring crush are strongly related to the runnability of corrugating medium. Using reclaimed corrugated stock also has a marked effect on resistance to failure.

48. How to reduce vessel-element picking in printing papers containing oak, by Von L. Byrd and D. J. Fahey. Paper Trade Journal 153:(54-9), November 24, 1969.

A method was found for quantitatively estimating the number of "harmful" vessel elements in a pulp furnish. Gyratory refining of the hardwood pulp component and surface sizing were both found to be effective in reducing the picking tendency of offset printing papers containing a high percentage of oak.

49. Alkaline stability of gluconic acid, cellobionic acid, and cellobiitol, by James L. Minor, Lowell E. Kihle, and Necmi Sanyer. Tappi 52(11):2178-81, November 1969.

The relative alkali stabilities of modified end groups were estimated by measuring the rates of degradation of cellobionic acid and cellobiitol as model compounds in 10 percent sodium hydroxide. The epimerization and degradation of gluconic and mannonic acids were also studied. (Highly technical).

WOOD PRESERVATION

50. Assay zones for specifying preservative-treated Douglas-fir and southern pine timbers, by R. H. Baechler, L. R. Gjovik, and H. G. Roth. Amer. Wood-Preservers' Assoc Proc., 8 pp. 1969.

Assay data are presented on the distribution of preservatives in timbers weighed before and after treatment in commercial charges. Retention gradients were considerably steeper in Douglas-fir than in southern pine. In both species, the outer 1/2-inch zone showed retentions similar to gain-in-weight retentions. (Highly technical)

51. Microscopic examination of pressure-treated wood, by Eldon A. Behr, Irving B. Sachs, B. F. Kukachka, and J. O. Blew. Forest Prod. J. 19(8):31-40, Aug. 1969.

Softwoods and hardwoods of several varieties were pressure treated with creosote or pentachlorophenol dissolved in aromatic gas oil. The disposition of preservative is traced in the many different types of cells of the xylem tissue. (Highly technical)

52. Protecting stored logs and pulpwood in North America, by T. C. Scheffer. Material und Organismen 4 Bd. 1969 Heft 3.

An assessment is made of the deterioration during storage of saw and veneer logs and pulpwood in North America, and the effectiveness of measures to prevent this deterioration is discussed. Principal regions dealt with are western United States and Canada, southern United States, eastern United States and the Lake States, and eastern Canada.

53. Studies of several methods for determining suitability of creosote for marine use, by R. H. Baechler, L. R. Gjovik, and H. G. Roth. Amer. Wood-Preservers' Assoc. Proc., 12 pp., 1969.

Discusses the need for better methods of analyzing marine-grade creosote. Relatively small amounts of petroleum oils are revealed by either the TEG-F or the specific gravity of fractions tests. Thin-layer chromatography offers a more sensitive test. Several methods are suggested for determining materials leachable by seawater. (Highly technical)

GENERAL

54. The Forest Products Laboratory--Research for today and tomorrow, by H. O. Fleischer. Southern Lumberman 219(2728):115-118, Dec. 15, 1969.

This picture article affords a brief look at some of the ways that FPL scientists have been able to apply their diverse skills and disciplines to unlocking the mysteries of wood and

its use and to developing new product ideas for the wood industries.

55. Sawmills of the future, by Herbert O. Fleischer. Southern Lumberman 219(2728):169-171, Dec. 15, 1969.

Explains the research that the scientists at the FPL are doing and are proposing to do in order to automate the decision-making involved in sawmilling.

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